INSTRUCTION MANUAL

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FOR FACTORY HELP

Sensitive Research*

AC/DC POLYRANGER

MODEL UX

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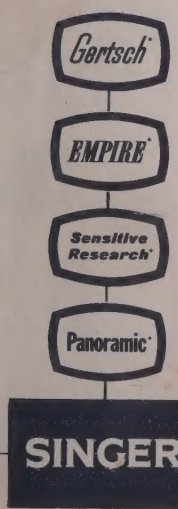


*A Trademark of THE SINGER COMPANY

Precision electrical and electronic instruments for measurement

THE SINGER COMPANY • METRICS DIVISION

OPERATIONAL AND MAINTENANCE PROCEDURE
for
MODEL UX
A.C.-D.C. POLYRANGER

The Model UX is a 51 range portable AC/DC electrical indicating instrument featuring increased scale resolution, automatic overload protection and auto-calibration capability. It is designed for those applications demanding a versatile self-contained instrument where good accuracy from DC to 15 kc, with operational safeguards and long term reliability, are important factors.

AC resolution is increased by electrically suppressing 40% of the full scale range. The ability to make measurements over the lower scale values is not affected since all ranges are overlapping and the suppression occurs in that area over which accurate readings cannot normally be obtained.

A "Self Checking" system allows for full scale sensitivity calibration (and simple screw adjustment, if necessary) against a ±.1% accurate, internal Zener diode reference source. The stability of the reference source is guaranteed to ±.05% for a period of one year. Operation is by plug-in to an external 60 cycle, 95 v-135 v power source.

The automatic overload protection feature enables the instrument to readily withstand overloads of 1000% on AC or DC without impairing operation or calibration. The value of this feature cannot be overestimated - especially in AC usage - since thermocouple linearity can easily be changed by overloads just short of complete burnout.*

*Ref: Sensitive Research ELECTRICAL MEASUREMENTS, Vol. 28, No. 1, Jan.,1961

The overload protection system safeguards the thermocouple from sharp transients or spikes from stored energy sources, as well as from sustained operational overloads, and substantially reduces the possibility of permanent damage or complete burnout. When used in conjunction with the "Self Checking" feature, accuracy and reliability are increased by a significant factor.

INITIAL INSPECTION

Upon receipt, your instrument should be carefully unpacked and examined for any visible external damage, i.e., split case, cracked glass, broken binding posts, etc. Place the instrument on a reasonably level bench. If the instrument has a wire shorting the terminals, it should be removed. Turning the mechanical zero adjuster, move the pointer both above and below the zero line of the scale. It should have sufficient travel to go a little beyond zero in each direction. Set the pointer exactly on zero while lightly tapping the instrument case with your fingers. The pointer will be correctly adjusted for zero when no reflection of the pointer's knife edge can be seen in the anti-parallax mirror, and the pointer is zeroed.

TEST FOR BALANCE

Balance requirements differ for our various types of instruments. The general testing procedure for balance on all models is the same, the difference being only in the degree of angle that the instrument is tipped from a horizontal position.

1. Set the pointer exactly on its zero position.

2. Now tip the instrument slowly from the side farthest from you to a 15 degree angular position.

3. Next, lay the instrument flat again and then tip it on its left side and tap gently.

In both these procedures the instrument should be within its balance specifications, which is 1/2 division on the D.C. scale.

FRICTION TEST

The instrument may be tested for friction by connecting it to a suitable source of power and deflecting it at least 25% of full scale, then slowly reducing the deflecting current to zero. No instrument should be accepted for use if the pointer does not return within .1 of a division from zero. Be sure that your controls operate smoothly so that there will be no false indication of the pointer's sticking.

CARE AND MAINTENANCE

Caution - Disassembly of the movement should not be attempted unless a skilled instrument man and calibration and scale drawing equipment are available.

Good practice dictates that periodic checks be made for pivot friction, balance and scale calibration.

If the instrument glass is cleaned, the task should be completed by heavily breathing upon it to dissipate any electrostatic charges that may have been generated by friction. Occasionally the binding post's metal contact surfaces should be cleaned and brightened by the careful use of a fine sandpaper.

The instrument case may be cleaned by using carbon tetrachloride to dissolve any greasy surface accumulations. A brisk rubbing with a soft flannel cloth will restore the moulded cases to their original lustre. Should the engraving "white" become discolored, it can be removed with a sharp point and refilled with a white wax crayon material available at a small cost from us.

OPERATION

1. Plug into 115 volt 60 cycle using the plug and cord supplied with the instrument.

2. Turn switch on the lower right of panel to its "ON" position, the red indicator will then glow.

3. To obtain full instrument accuracy WAIT 15 minutes.

4. Using the finger operated zero screw, set the instrument pointer to its mechanical zero. Be sure the A.C. - D.C. CIRCUIT SELECTOR switch is in the D.C. position.

SELF CHECK PROCEDURE

PLACE ~~Function switch~~ CIRCUIT SELECTOR IN THE "D.C. CIRCUIT" POSITION

a) Depress the "self check" button.

b) The instrument pointer should deflect to EXACTLY full scale. If NOT adjust the D.C. full scale adjustment screw on the right of the panel until the pointer reads EXACTLY full scale.

c) Switch the CIRCUIT SELECTOR switch to its A.C. position.

d) Again depress the "self check" push button, the pointer should deflect to exactly full scale.

SOPS. 4-1

e) If not, then adjust the A.C. full scale adjustment screw.

NOTE

SELF CHECK PROCEDURES A to E are required only to correct for long term drift, severe temperature changes or thermocouple overload. If the A.C. full scale adjustment screw does not have sufficient range to bring the pointer to full scale it indicates that the thermocouple has been severely overloaded and requires replacement. Replacement thermocouples may be ordered from us. Be sure to give us the serial number of the instrument when ordering.

OPERATION (continued)

1. Set the A.C. - D.C. CIRCUIT SELECTOR switch for the measurement desired.

2. Set the range switch for the range desired.

3. Connect the external circuit to be measured to the appropriate binding posts and read the instrument.

CAUTION

Note that there are SEPARATE A.C. and D.C. scale markings.

THERMOCOUPLE REPLACEMENT (Type UXR)

a) Remove the circular disk covering the thermocouple which is located on the upper left side of the instrument.

b) Unsolder and remove the complete thermocouple and its two (2) associated resistances.

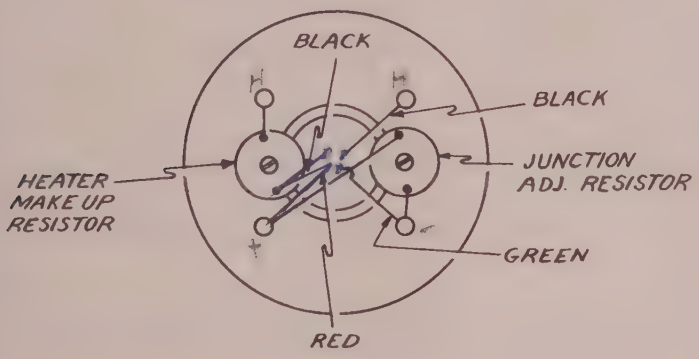
c) The replacement thermocouple as supplied by us will be accompanied by two (2) small resistance bobbins.

d) Do not attempt to replace a thermocouple in a room where there is loose dirt or any magnetic particles about. There is a possibility that these particles will be attracted into the strong magnetic gap of the movement, thus causing a sticky pointer action.

e) The thermocouple is a small glass bulb 1/2" in diameter x 3/4" long that is installed in the bakelite holder. There are four leads, (two black, one red and one green) protruding from the base of the thermocouple. The black covered leads are called heater leads. They are connected to the ends of the thermocouple heater element. The red and green leads are called junction leads. The red lead is the (+) positive side of the D.C.

millivolt output, and the green lead the (-) minus side of the D.C. millivolt output.

One resistance (a low value of approximately 2.5 ohms) is connected in series with one of the black heater leads. The other end of this resistance is to be soldered to one of the connection lugs marked "H". The other resistance is connected in PARALLEL with the RED and GREEN leads.
Δ Junction adjust (see schematic)
The red lead is soldered to a connecting lug marked +(plus), the green lead is soldered to the -(minus) terminal, and the other black lead of the thermocouple is soldered to the remaining lug marked "H". These resistances are roughly soldered to their correct leads so they cannot be misplaced. Unsolder them before placing them in their proper positions.



To remove the old thermocouple unsolder the following leads located on the moulded bakelite holder.

1. "Red" thermocouple lead and resistor lead from the plus connection lug.

2. "Green" thermocouple lead and resistor lead from the minus connection lug.

3. The "Black" lead from the H. connection lug.

4. The end of the resistance that goes to the other H. connection lug.

Remove the flat head machine screws that hold the 2 resistances in place, grasp the four thermocouple leads near the base of the thermocouple and pull straight up. Solder the thermocouple leads, with the 2 resistances

which are supplied with the thermocouple, back into place. Set the thermocouple container back into the bottom of the case and replace the screws.

While the foregoing appears to be complicated, it can be done by a careful person in a few minutes.

Very Important

The D.C. millivoltmeter used as the indicator in thermal type instruments will respond to any emf's in the junction circuit. Because of this, it is extremely important that heat of the newly soldered joints be allowed to completely disappear before checking the accuracy of the instrument, because of any thermal emf's that may be created by this heat.

WAIT AT LEAST 1 hour after soldering couple before testing instrument.

SPECIFICATIONS

DC RANGES: 0-5/10/20/50/100/200/500 mv; 1/2/5/10/20/50/100/200/500/1000 v; 0-*.2/.5/1/2/5/10/20/50/100/200/500 ma; 1/2/5 amperes

*This range is also 2 mv ±.2%

AC RANGES: .2-.5/1/2/5/10/20/50/100/200/500/1000 v; 2-10/20/50/100/200/500 ma; 1/2/5 amperes

ACCURACY: AC and DC ±.5% of full scale.

FREQUENCY RANGE: DC & 7 cps - 15KC on voltage; to 15KC on milliampere current and 5KC on the ampere current ranges.

SENSITIVITY: DC voltage 5000 ohms per volt; AC voltage 100 ohms per volt.

SCALE LENGTH: Actual scale length 5.2". Effective scale length is greater by 40% on AC.

Automatic Temperature Compensation between 20° - 30°C. Replacement thermocouple feature. Hand drawn mirrored scale. Electrostatic and magnetic shielding. Switch controlled ranges. Formica case. Shock mounted jewels, and Diamond Pivoted, of course!

Continuous operation for more than twenty minutes on the 500V, 1000V, and 5 ampere ranges will cause self heating effects due to power dissipated on these ranges. Errors slightly beyond guaranteed accuracy will occur which will require resetting of the zero and self-check of full scale to maintain accuracy. These changes will not cause permanent damage for continuous operation for any length of time.

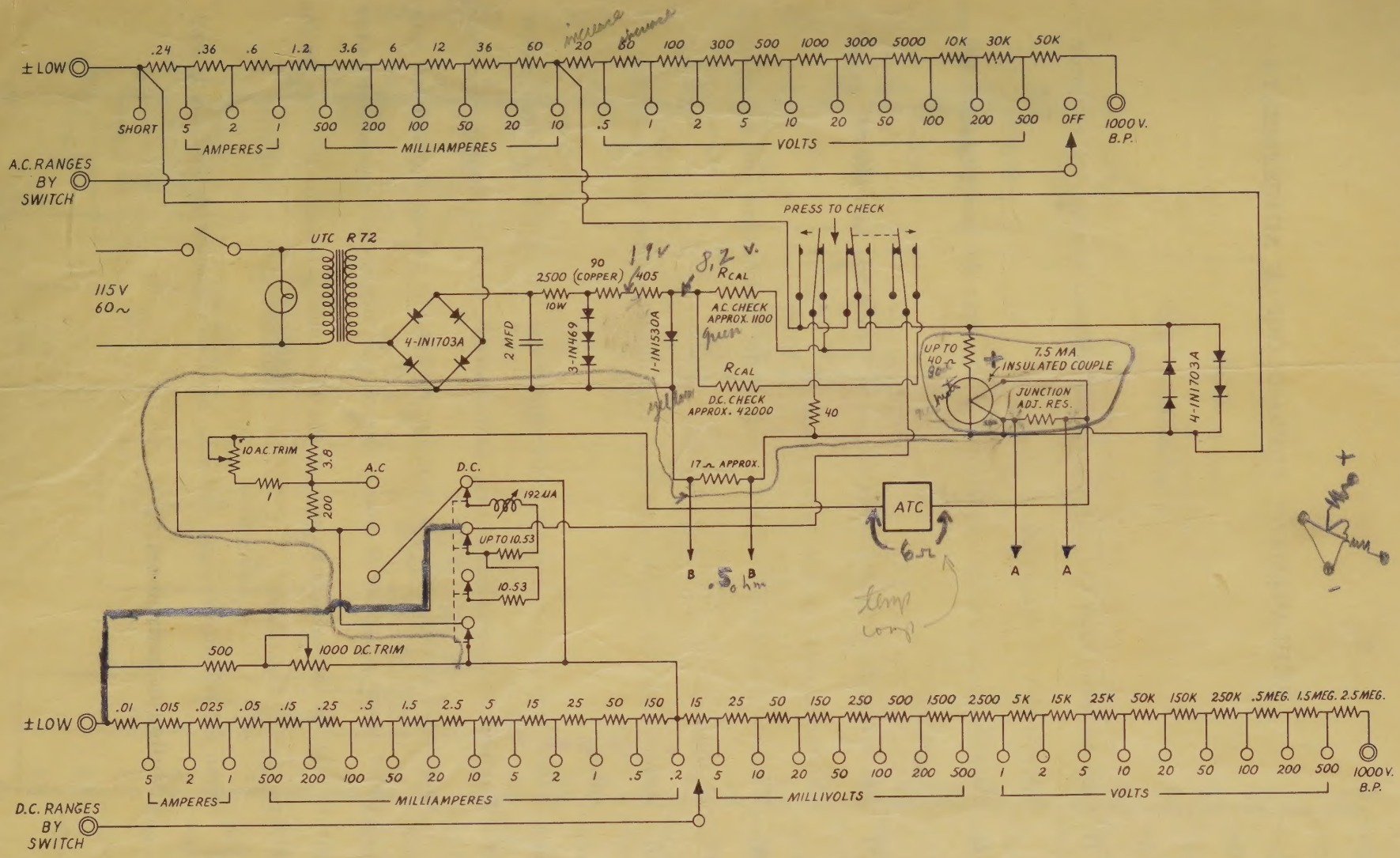
SIZE: 17 5/8" x 7 1/2" x 6 3/8" high

WEIGHT: 18 lbs.

SHIPPING WEIGHT: 30 lbs.

The calibration of all instruments by Sensitive Research is directly traceable to the National Bureau of Standards in Washington, D. C. or Boulder, Colorado. Unless otherwise stated, warranty is for a period of one year.

MODEL "UX"
EXPANDED SCALE A.C. - D.C. POLYRANGER



Schematic Diagram, Model "UX" Replacement Thermocouple Adjustments

REPLACEMENT THERMOCOUPLE ADJUSTMENTS

FOR

MODEL "UX"

1) Attach two leads for adjustment of junction sensitivity resistor makeup (points AA on diagram).

2) Attach two leads for adjustment of the 4ma AC point (points BB on diagram).

3) Set instrument function switch to AC position, and set AC range selector switch to the 10ma position.

4) Connect test leads to the AC side of the instrument and energize for 10 ma.

5) Adjust junction makeup so that instrument reads full-scale for 10ma.

6) Apply 4ma to instrument, and adjust 4ma shunt for the 4ma point.

7) Recheck top point for 10ma, and readjust junction sensitivity resistor makeup if necessary. If junction makeup is changed, recheck 4ma point again as there is some interaction between these adjustments and it may be necessary to repeat the 4ma and 10ma check three or four times.

8) When all AC adjustments check, have resistance values made and installed in instrument.

MODEL "UX"
EXPANDED SCALE A.C. – D.C. POLYRANGER